CLAIMS

What is claimed is:

1. A method for inspecting objects, the method comprising:

creating a reference image for a representative object, said reference image comprising an at least partially vectorized first representation of boundaries within the image;

acquiring an image of an object under inspection comprising a second representation of boundaries within said image; and

comparing the second representation of boundaries to said at least partially vectorized first representation of boundaries, thereby to identify defects.

2. A method according to claim 1 wherein the comparing step employs a user-selected variable threshold for acceptable distance between corresponding portions of the boundaries in the first and second representations.

3. A system for image processing comprising:

a boundary identifier operative to generate a representation of boundaries of known elements in the image;

a hardware candidate defect identifier operative to identify candidate defects in the image, in hardware;

a software candidate defect inspector receiving an output from the hardware candidate defect identifier and using the representation of boundaries to identify at least one false alarm within said output, in software.

4. A system according to claim 3 wherein the boundary identifier comprises a hardware boundary identifier operative to generate a representation of boundaries of known elements in the image, in hardware.

5. A system according to claim 3 and also comprising a software candidate defect identifier operative to identify additional candidate defects in the image, in software.

6. A system according to claim 5 wherein the software candidate defect inspector also receives a second output from the software candidate defect identifier and uses the representation of boundaries to identify at least one false alarm within said second output, in software.

7. A system according to claim 3 wherein said hardware candidate defect identifier employs said representation of boundaries in order to identify at least some candidate defects.

8. A system according to claim 5 wherein said software candidate defect identifier employs said representation of boundaries in order to identify at least some candidate defects.

9. A system for image processing comprising:

a learning subsystem operative to define first and second areas in an object under inspection wherein the first areas each comprise at least one known critical object element and the second areas include no such known critical object elements; and

a defect detector operative to inspect said first areas using a first procedure based on prior knowledge regarding said known critical object elements and to inspect said second areas using a second procedure which differs from said first procedure.

10. A system according to claim 9 wherein said second procedure comprises a hardware inspection of a second area operative to identify candidate defects in the second area and a subsequent software inspection of the second area, only if at least one candidate defects are found in the second area, and operative to analyze the at least one candidate defects found in the second area and to identify false alarms therewithin.

11. A method for inspecting an object comprising:

in a first stage of inspection:

identifying a location of at least one candidate defect; and

for each candidate defect, determining of a candidate area, at said location, for inspection at least of the size and shape of the contour area being based, at least in part, on an output of the identifying step; and

in a second stage of inspection:

inspecting each said candidate area to confirm the defect.

12. A method according to claim 11 and wherein said first stage is carried out in hardware.

13. A method according to claim 11 and wherein said second stage is carried out in software.

14. A method according to claim 11 wherein said step of determining comprises determining the size of a candidate area at a known location.

15. A method according to claim 11 wherein said second stage comprises performing different inspections depending on criteria of the candidate area or of the candidate defect.

16. A method according to claim 11 wherein said second stage comprises performing different inspections depending on characteristics of said at least one candidate defect as identified in said identifying step.

17. A method according to claim 11 wherein said second stage comprises performing different inspections depending on functionality of the object portion in which the candidate defect resides.

18. A method according to claim 11 wherein said second stage comprises performing different inspections depending on the degree of criticality of the functionality of the object portion in which the candidate defect resides.

19. A modular image processing system with user-customizable image analysis functions, for use in conjunction with a scanner, the system comprising:

an image processing engine receiving at least one stream of image data to be analyzed from the scanner; and

an engine configurator operative to receive a sequence of definitions of at least one user-customized image analysis function to be performed on the image data by the image processing engine;

wherein the image processing engine is operative to analyze at least one channel of image data in accordance with each definition in the sequence of definitions fed into the engine configurator, including performing different image analysis functions, differing from one another more than only as to parameters, depending on a current definition arriving at the engine configurator from among said sequence of definitions.

20. A method for automatically optically inspecting an object, comprising:

defining a plurality of regions of interest for image processing, said regions of interest including at least one region of interest defined by a user and at least one region of interest automatically defined by optically inspecting the article; and

providing to an image processor an image of an area surrounding each region of interest;

automatically processing each said image of an area surrounding a region of interest to determine the presence of defects in the article.

21. A method according to claim 20 wherein each image of an area surrounding a region of interest is smaller than an image of the object.

22. A method according to claim 20 and wherein the region of interest automatically defined by optically inspecting the article comprises a candidate defect in a pattern formed on the object.

23. A method according to claim 20 and wherein the region of interest automatically defined by optically inspecting the article comprises a predetermined morphological feature formed in a pattern on the object.

24. A method according to claim 20 and wherein the providing step comprises providing a color image of the region of interest to the image processor.

25. A method according to claim 20 and wherein the automatically processing step comprises applying, to regions of interest defined by a user, at least one image processing method that is different from an image processing method applied to regions of interest automatically defined by optically inspecting the article.

26. A method according to claim 22 and wherein the providing step comprises identifying the type of defect in the region of interest, and the automatically processing step comprises applying an image processing method that is suited for the type of defect in the region of interest.

27. A method according to claim 23 and wherein the providing step comprises identifying the type of morphological feature in the region of interest, and the automatically processing step comprises applying an image processing method that is suited for the type of morphological feature in the region of interest.

28. A method according to claim 20 and wherein the at least one region of interest defined by a user is defined prior to optically inspecting the object in a software definition step, the at least one region of interest automatically defined by optically inspecting the article is performed in a hardware inspection step, and the automatically processing each image of a region of interest is performed in a software image processing step.

29. A method for inspecting ball grid array substrates, the method comprising:

generating at least one model for at least one feature in a reference image of a ball grid array substrate, and storing the model in memory;

acquiring an image of said ball grid array substrate; and

inspecting predetermined regions of said image of said ball grid array substrate to determine whether a feature in said predetermined region fits the model.

30. A method according to claim 29 and wherein the feature comprises a circle.

31. A method according to claim 30 and wherein the model of the circle comprises a center point at a predetermined location and a radius within a predefined tolerance.

32. A method according to claim 31 and wherein the parameters of the model are at least partly adjustable in an off-line mode prior to inspection.

33. A method according to claim 29 and wherein the feature comprises a bonding pad.